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FOOD ZONES OF CANADA:

Their Extent and Capabilities.

BY

J. BEAUFORT HURLBERT, LL.D.

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1884.

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ONE hundred years ago England exported wheat ; now she imports one-half her consumption. During the last fourteen years the annual consumption has been 22,500,000 quarters, and the home growth 11,500,000. The present consumption is 24,000,000 quarters. From 1850 to 1870 she consumed annually, on an average, wheat to the value of £55,500,000 ; of this amount £37,000,000 were produced at home, and £18,500,000 imported. From 1870-80 she consumed annually, on an average, wheat to the value of £57,500,000, of which only £24,000,000 were produced at home, and £33,500,000 imported. Thus in the ten years between 1870-80 England produced annually to the value of £13,000,000 less, and imported annually to the value of £15,000,000 more than she did in the previous 20 years, between 1850-70—a difference against her of £28,000,000 per annum. During the last ten years the capital of the agricultural classes has fallen in value to the extent of £500,000,000 to £600,000,000, and their incomes £21,000,000, and the loss is still going on with accelerated speed.

During the last ten years more than a million acres have gone out of wheat cultivation, so that now (in 1882), if the population had remained stationary, England would be in a position to feed three millions and a half of people less than in 1872 ; but during that period her population has increased 3,000,000, and in 1882 she is forced to import wheat and flour to feed six millions and a half more than in 1872. She grows less corn now to feed 34,000,000 than she did forty years ago to feed half that number.

Her dairy farming, market gardening, and small rural industries, if not rapidly disappearing, as some writers assert, are greatly depreciated. Her importation of meat, dairy produce, and vegetables averages £45,000,000 per annum more than it did ten years ago. In 1880 she imported 2,326,000 cwt. of butter, valued at £12,141,000 ; 1,775,000 cwt. of cheese, valued at £5,000,000 ; £10,000,000 of live stock, and meat fresh and salted to the value of £16,429,000.

In 1880 the total consumption of bread-stuffs (grain, flour, potatoes, and rice) was 340,000,000 cwt. ; of this the home supply was 193,200,000 cwt., and the imported 146,800,000 cwt.—the imports being to the whole consumption as three to seven nearly. The consumption, the same year, of meat-stuffs (beef, mutton, bacon, butter, and cheese) was 36,000,000 cwt. ;

of this the home supply was 24,500,000 cwt. and the imported 11,500,000 cwt.—the imported to the home supply being as 23 to 49, and the imported to the total consumption as one to three.

In 1861 the value of food imports into Great Britain per head was £1 11s. 11d.; in 1871, £2 1s. 3d.; in 1880, £3 4s. 11d. Comparing the five years from 1860-4 with the five from 1875-9—the first five with the last five of the twenty years from 1860 to 1879—we have the authority of Sir James Caird for the statement that wheat had increased 75 per cent., but the price had fallen only four per cent. Of barley the imports increased 90 per cent., and the price had risen 10 per cent.; of oats the imports increased 122 per cent., and the price 14 per cent.

The increasing population, and diminishing power to feed that population, must aggravate year by year, and to an alarming extent, England's dependence upon foreign countries for her food supplies. This dependence would be the more embarrassing should England be involved in a war with a great maritime power. Whence is this deficiency to be made up? Every country of Europe from which Great Britain has drawn bread-stuffs now consumes more and more of her own products. Southern Europe, Australia, and many wheat-growing States of the American Union, are subject to severe and protracted droughts during the agricultural months. All these countries, moreover, are too far south to be depended upon for a large and regular supply of wheat. Australia and California are, in addition to their semi-tropical climates, nearly half the circumference of the globe from the British Islands.

The average product of wheat in the United States is 13·1 bushels per acre; in France, 16 bushels; in Russia, 5·4; in Austria, 14; in Italy, 12·3; in Australia (1877, below the average), 5·4; in Canada, 20. Russia and France produce each 240,000,000 bushels; Germany, 126,000,000; Great Britain and Austria, each 92,000,000; the United States (1880), 459,000,000; and Canada, 80,000,000. These quantities would give, for home consumption, to Russia three bushels per head of her population; to France, 5½ bushels; to Germany, 2·7; to Austria, 2·3; to the United States, 9; to Canada, 18; and to Great Britain, 2·6. The only countries upon which England can rely for her bread-stuffs are Russia, France, the United States, and Canada. Five bushels per head are allowed in Canada for home consumption. With this allowance, only France, the United States, and Canada would have a surplus; Russia has but three bushels, and Great Britain 2·6 per head. But some of the Continental countries use, to a large extent, rye, barley, and oats as a substitute for wheat. In 1840, the United States produced but 80,000,000 bushels; in 1860, 160,000,000; and it was not until 1880 that we find such a large yield, 459,000,000 bushels, and this is due chiefly to the cultivation of new fields bordering on Manitoba, but that region, owing to severe protracted summer droughts and the thinness and poverty of the soil, cannot permanently be depended upon for such a large supply. There are besides some 25 States of the Union which do not pro-

duce enough wheat for their own consumption. The exports of bread-stuffs fell off from £47,602,000 sterling worth in 1880-1, to £34,579,000 in 1881-2, 35 per cent.

What promise does Canada, with her vast territories of virgin soil in Manitoba, and for a thousand miles to the west and north-west, give for supplying this deficiency? Railways are now rapidly penetrating that Great Lone Land. The magistrate, the mounted police, well-organised municipal and central governments have given security to life and property even far beyond the reach of the railways. The blessings of education and Christian ordinances reach every little community. Indeed, the missionary had long occupied the entire field, and where through all the past nought else was seen but the trapper and his pelts, there is now heard the sound of the church-going bell, calling a busy, a thriving, a happy population to the temples of their God.

In Manitoba the yield of wheat is 28½ bushels per acre, under very *imperfect tillage*. The wheat, too, is heavier, and makes more flour, pound for pound, than the wheat from any part of the United States. Trustworthy reports have placed the yield as high as 60 bushels per acre where care had been taken in the preparation of the soil. A farm of 62 acres gave 55 bushels per acre, weighing more than 60 lbs. to the bushel. This statement is given on the authority of Mr. T. H. Schneider, of Winnipeg. The product of wheat in Ontario in 1882 was 41,648,196 bushels; of this 32,352,402 bushels were winter wheat. The yield per acre in the other Provinces of the Dominion is probably as great as in Ontario, but this cereal is not cultivated to the same extent as in Ontario, a larger percentage of the land being given to the coarser grains, root crops, pastures, and meadows.

If England should be engaged in a war with the United States, or with one of the great powers of Europe, privateers would swarm over the seas, intercepting her merchantmen. The contingency of war must never be forgotten in the forecast of a nation's future, and England makes all her calculations upon the assumption that she will be mistress of the seas. In a few years Canada could supply the food deficiency of the British Islands. If only a tithe of the fertile lands in Manitoba and the territories to her west and north-west were under cultivation, they could furnish food for the 30,000,000 odd of her population. Port Nelson, on Hudson Bay, is nearer Liverpool than New York, and Port Nelson is within 300 miles of Lake Winnipeg, the centre of the fertile plains of the North-West. Two railways have been chartered from Lake Winnipeg to the Bay, one to Port Nelson and the other to Port Churchill. In the summer of 1881, preliminary surveys were made over one of those routes. Both coasts would be British territory. No shelter for privateers could be found north of the route from Hudson Bay to Liverpool; from the south alone would her corn-laden ships be exposed to danger. It would be the shortest and easiest line to defend. That route has been used for 200 years by sailing vessels in the service of the Hudson's Bay Company. Agricultural products are heavy and costly of transit, and

shipments through Hudson Bay would save 2,000 miles' inland navigation.

The productions of Canada are mostly similar to those of Western, North-Western, and Central Europe, the great staples being those of the middle and higher parts of the temperate zones. The cereals, grasses, root crops, and hardier fruits of Europe, find here, more than in any other part of the American continent, their appropriate climates. The four decennial censuses of Canada show that she produces per acre more abundant and surer crops of the cereals, grains, grasses, and root crops, and those of better quality, than any of the States of the Republic. This is true of wheat, oats, barley, peas, rye, most of the ordinary root crops (as potatoes, turnips, beets, carrots, &c.), and the hardier fruits. The Canadian census of 1851 shows that Canada even then produced one-sixth as much wheat as all the thirty-one States and four territories, one-half as many peas, more than one-seventh as many oats, more than one-fourth as much barley, and nearly one-eighth as much hay as the entire Republic.

The census of 1861 was still more favourable to Canada. She then produced more than one-sixth as much wheat, nearly as many peas, one-fourth to one-fifth as many oats, and one-third as much barley as the thirty-four States and seven territories.

The census of 1870 and 1880 is more favourable to the Republic in the one article—wheat—as large tracts of new lands had recently been brought under cultivation west of the Mississippi, and bordering on Manitoba. The wheat in those territories, like that in California, is sown chiefly in the autumn, and ripens before the drought and heat of summer. But that region is unfavourable for the coarser grains, grasses, and root crops, from the deficiency of summer rains. In addition to these droughts, the soil is too thin and sandy to make it permanently a good wheat country.

Anyone acquainted with the agricultural products of Europe, and with the climates adapted to them, will at once see the cause of this. The parts of Europe north of the parallel of 45° (and Canada goes to 42°) embrace the British Islands, Norway, Sweden, Denmark, Prussia, Belgium, Holland, Austria, Hungary, Switzerland, Northern Italy, most of France, and Russia. The whole of the American Union, east of the lakes, is south of 45°, except that part of Maine surrendered under the Ashburton treaty. Very small portions of Wisconsin and Michigan, and part of Minnesota, are north of this parallel. If it be said that America is very different in climate from Europe, we answer, that that difference is unfavourable for the United States and favourable to Canada, as the facts stated below will show. America, it is said, is colder than Europe. It would be difficult to state the climatal conditions of the two Continents more loosely and erroneously. From the influence of the tropical currents of ocean and air, the western coasts of both continents are warmer than the eastern; but the summer temperatures, which are of chief importance in agriculture, are higher, as we get a little from the Atlantic coast, in

America than in Europe, and too high throughout the United States for the great staples of the temperate zones. The summer of the British Islands is from 57° to 62° Fahrenheit, the summer of Illinois is 13° higher than this; Ohio, from 70° to 74°; and Iowa still higher, 72° to 78°; Kansas and Missouri higher still.

But high temperatures and a burning sun are not the only enemies with which the agriculturist so far south has to contend. The want of rain is another and even more grievous defect in the climate in those parts of the United States; for high summer temperatures, with heavy rains, are conditions of climate favouring tropical plants, but high temperatures without rain are destructive to all vegetation; and high temperatures with an insufficiency of rain give only imperfect crops. Those parts of the States lying west of the Mississippi resemble Palestine, Arabia, Persia, Syria, and Turkistan. Both regions are similarly situated on the Continents, both are in the zones of the summer droughts, high temperatures, arid winds, and rapid evaporation, but with this important feature in favour of the Asiatic countries—they lie near the ocean and Mediterranean Sea, which render the atmosphere more humid, and modify the droughts.

Nor would the effects of the want of summer rains be fully stated without reference to the rapid evaporation in countries situated like those named. In England the evaporation in summer is from 40 to 60 per cent. of the rainfall, leaving from 60 to 40 per cent. in the soil, affording moisture to plants while working its way slowly to the rivers. In Baltimore (lat. 39° 18'), although near the ocean, the evaporation in summer is double the rainfall. Inland, in Missouri, Kansas, Illinois, Iowa, and the whole region thence to the Pacific, the evaporation is much more rapid than on the sea coast. These States, too, lie east of the great desert and semi-deserts, stretching from the 98th meridian (the western boundary of Iowa and Minnesota) to the Pacific. The prevailing winds in summer on this part of the Continent, being from the west and south-west, blow almost uniformly over the States lying eastward and north-eastward, and being arid burning winds, parch the land and wither up every green thing. Minnesota and Wisconsin are less, but only less, affected by these winds, for they border on those inland seas, whose waters, from their great depth, being cool even during the summer months, check the evaporation and increase the rainfall.

We need not here refer to some portions of the middle States, which, from their altitude or other causes, have cooler climates, or to California, where the winter and early spring are favourable to the growth of wheat, but not for the other grains, the grasses, or roots. We are not dealing with exceptional cases. The greater portions of the States east of the Mississippi lie too far south for the great staples of the temperate zones. As a general rule, the grasses (the timothy, clover, &c., and grasses that make our pastures and meadows) fail south of latitude 39° east of the Mississippi, and even to lat. 50° west of it; and where the grasses fail, the dairy, the sheep, and herds of cattle, with all their accompanying blessings, must be given up

as a chief element in farming ; for the wild prairie grasses of those regions when ploughed up cannot be reset, and therefore are of no value as cultivable grasses.

The temperatures of the summer months are those of chief importance in agriculture and horticulture. The winters have no unfavourable effect upon plants, for the maturity of which the summers are long enough and warm enough ; nay, the intervention of winters such as prevail throughout Canada, with the temperature low enough to secure a covering of snow, is good both for the plant and the soil. The frosts of winter, too, leave the land in a very friable state, and in better order than any number of ploughings could make it. The winter grains, the grasses, the roots of trees and shrubs, are protected from the wind and the sun, the soil, too, being covered with snow till the sun is warm enough to start vegetation, is not dried up, as we find it in the Western States and in Southern Europe, in late winter and early spring. Then the gradual melting of the snow fills the earth with moisture, so necessary for the germination of seeds and plants. The rains of spring and early summer follow ; these favouring circumstances, accompanied by moderate temperatures, render Canada, as a grazing and grain-growing country, immeasurably superior to Southern Europe and to the United States. "Canadian wheat," says Marshall, "is one of the finest in the world ; oats, barley, maize, and other grains yield excellent crops." These grains, with the rich pastures and meadows, herds of horn-cattle, sheep, and horses, are not the great staples along the shores of the Mediterranean, as in Canada.

After the cool months of spring and early summer, so favourable for the hardier grains and grasses, the high temperatures of July and August mature even sub-tropical plants throughout the valley of the St. Lawrence, and far up into the North-West. The melon, pumpkin, squash, tomato, cucumber, &c., come to great perfection in the open air. Hence the great variety of vegetable products in Canada, from the tender plants of tropical and semi-tropical origin to the hardier ones of the middle and higher temperate zones. In countries such as those of Southern Europe and the Western States, the ground had been dried by exposure to the sun and winds before the warmth of spring starts vegetation. This is often followed by great heat, summer droughts, arid winds, and rapid evaporation, parching the land and withering the plants. Besides, climates favourable for the orange, lemon, and such tropical fruits and plants as find a genial home around the shores of the Mediterranean, are destructive of others even more valuable.

The long and severe winters of Canada are, by strangers, supposed to be almost insuperable obstacles to keeping large herds of cattle. We cannot here discuss the question farther than to refer to the facts already stated of the more luxuriant growth in Canada of the grains, grasses, and root crops, and that Canadian farmers keep more stock than American, that immense numbers of horn-cattle, sheep, and horses are exported every year to the United States, and that hay from low down the St. Lawrence is sent, more than a thousand miles, to Chicago, on the borders of the great

prairies of the West. In Northern and North-Western Europe, even where there may be no snow, grasses grow very little, or not at all, during that part of the year covered with snow in Canada; and it would no doubt be better both for the soil and plants in those countries had they a similar protection from the winds and sun of winter and spring.

Marshall, in his work on Canada, published ten years ago, says he found "excellent Durham, Devon, and Ayrshire cattle, Cotswold and Leicester sheep, Essex, Suffolk, and other well-known breeds of pigs, and many excellent draught and road horses. I was not prepared," he says, "for the evidence of such widespread interest in this branch of the farmer's occupation, and such general excellence of results as I found here."

In this connection it should not be forgotten that the chief grazing and grain-growing countries of Europe are in the higher parts of the temperate zone, and must, from similar causes, be in corresponding parts in America—in other words, in Canada.

The length of winter in such climates, it is often said by Europeans, limits very much the period of outdoor operations. Professor Johnson quotes the opinion of sixty-two experienced farmers to this effect—that the frosts of winter open and make friable the soil to such a degree that the labour expended upon it goes much farther than in England; that one ploughing is, in fact, so far as the mechanical loosening of the soil is concerned, equal to two in countries without such frosts; that the rains in Canada falling more in short showers than in protracted rains, as in Great Britain and Ireland, the number of working days is greater in the spring months in the former than in the latter country; that the rapidity with which crops come to maturity leaves a longer period for ploughing and outdoor work, both before the seed is sown and after the crops are reaped; that by stabling and keeping together the stock, more manure is saved; and finally, there is much work which can be far better done in winter than in summer, as the felling and cutting of trees, so much easier with the frost in the wood, clearing the land, hauling manure to the remoter parts of the farm, fencing and wood from swamps and places difficult of access in summer, conveying produce to market at distances with a speed and in quantities which would not be practicable on wheels, and many other things known only to those living in such countries.

The northern limit of wheat is about 58° north latitude; in Norway it ripens as high as latitude 64°, and in Sweden to 62°, but is not much cultivated beyond 60°, and falls off gradually in the east.

In the interior of the Continents it matures north of latitude 60°, where the summer temperatures are at 60° Fahrenheit, with one month at 63°. On western coasts, especially in the higher latitudes, in addition to low temperatures, the growth of wheat is restricted by a too humid atmosphere, and by the prevalence of fogs and clouds.

Sir John Richardson ("Arc. Exp.," vol. 2, p. 207) says that wheat is grown with success in latitude 60° 5', near the borders of Great Slave Lake.

Bishop Taché found it growing up to 62° on the same lake, and further west it will mature at a higher latitude. It grows freely on the Saskatchewan (lat. 54°), and luxuriantly in the valleys of the Assiniboine and Red Rivers, often producing, with imperfect tillage, 40 bushels to the acre, and grown in successive crops for twenty years on the same fields. This region is, says Blodget, the seat of the greatest average yield of wheat on the continent, and probably in the world. ("Can. Pacific, Desc. of Route," 1876, p. 33.)

"Two-thirds of the Peace River region (extending to latitude 60°) is fit for wheat." (Prof. Macoun's evidence, 1876.) Even near the southern shores of Hudson Bay, at Fort Moose, "where the soil is a cold, wet clay, with a level, undrained surface, wheat accidentally sown was found to ripen." (Bell's "Rep. Geol. Survey," 1877.)

Hence the immense areas in the North-West in Canada favourable for wheat. South of the Northern limits, where wheat has been found maturing, east of the Rocky Mountains and west of Ontario, there are some 950,000 to 1,000,000 square miles in these north-west territories of Canada. This immense area of 600,000,000 acres lies in a similar position on this Continent, and with climates almost identical with the best wheat countries of the Old World—the western, northern, north-western, and central parts of Europe. It lies, too, in the valleys of the great rivers of the northern half of the Continent—the Saskatchewan, Assiniboine, Red, Winnipeg, Peace, Athabasca, and Mackenzie, with probably a larger percentage of tillable soil than any equal area in the Old World.

Even to this vast area we must add at least another 200,000,000 acres—over 300,000 square miles—of wheat land in old Canada, covering the valley of the St. Lawrence, New Brunswick, Nova Scotia, Prince Edward Island, British Columbia, and Vancouver.* Wheat and other grains, it must be remembered, produce more per acre, with surer crops, in the higher latitudes and near their northern limits.

Deducting from these 800,000,000 acres the usual allowance for mountainous districts and cold soils—this latter to include all north of the summer isothermal of 63°, which reaches the parallel of 62° in the interior—there would still remain a practically boundless area of the best wheat land on the Continent.

In stating the Northern limits of these plants, it is not, of course, assumed that they can be profitably grown at such high latitudes, although they usually produce surer and better crops near their Northern limits; the reference is made to show the area adapted to their culture.

Great Britain, one of the most favoured regions for wheat, has a summer of about 60° to 62°; London has 61° 9'; Glasgow, 60°; Swansea, 62°; Dublin, 60°; Liverpool, 57°, 6'; and the central counties of England 62°.

Canadian summers, necessarily varied over such a vast region, have

* The area of these Provinces is 700,000 square miles, to the northern limits of which wheat grows. It embraces some of the best wheat land on the Continent. We include in our estimate less than half.

nearly the same temperatures as the best wheat districts of the old world—from 60° to 70° . Halifax has $60^{\circ} 8'$; Fredericton (New Brunswick), $64^{\circ} 8'$; Quebec, 69° ; Montreal, $70^{\circ} 8'$; Toronto, $64^{\circ} 8'$; Manitoba, 67° to 70° ; Vancouver, $61^{\circ} 5'$.

The cultivated cereal grains and grasses come to us through the cool, humid, equable climates of the west of Europe, and thrive best and almost exclusively in similar districts on this Continent, which are North of the United States.

The statements made in reference to wheat apply to barley, rye, and other small grains, except that these go into colder and more humid climates by nearly five degrees of mean temperature. They bear colder summers, poorer soils, and shorter periods of growth. Barley is the most flexible, ripening its grain in the short summers under the Arctic circle on the West of Norway, and going nearly as far on Mackenzie River in North America. Oats bear cool, humid climates better than wheat, and upon poorer soils.

Barley occupies the most northern limits of grain culture, ripening at 70° north latitude in Lapland, at $67\frac{1}{2}^{\circ}$ to 68° in northern Russia, and 68° in the eastern parts. On the north-west coast of Europe it does not go so far north, as the mean temperature of the summer months falls, and the climate, through excessive moisture, is less favourable. It extends from the north of Scotland to the Shetlands, but seldom ripens properly.

In North America barley ripens well at Fort Norman in latitude 65° , 400 miles north of the Orkneys and the capital of Sweden, and 350 miles north of the capitals of Norway and Russia. As barley will mature five degrees farther north than wheat, no doubt when these northern countries in Canada shall have been cleared of the forests, and the land drained, barley and other food plants will, in the new world, ripen as far north as in the old. On the Peace River, in latitude $58^{\circ} 9'$, longitude 116° , barley sown on the 8th of May was cut on the 6th of August, 90 days. The grain was large and of beautiful colour. (Macoun's Geol. Rep., 1875-6, p. 159.)

The summer of Yukon, west of Mackenzie River, under the Arctic circle, is $59^{\circ} 7'$, with a July at $65^{\circ} 7'$. These temperatures are high enough and the summer long enough to ripen barley.

The northern limit of rye in Norway is 67° , in Sweden 65° to 66° , in Russia 63° to 64° , following the same curve as oats. In Siberia, rye is grown up to the northern limits of corn culture, and in the north-west of Canada it is also found to ripen as far north as barley; but we have not the data to justify us in fixing its northern limits.

As barley and rye ripen four to five degrees farther north than wheat, there are at least half a million of square miles more land adapted to these grains than to wheat in the North-Western Territories of the Dominion.

Oats are grown to the extreme north of Scotland, in latitude $58^{\circ} 40'$; in Norway to 65° ; in Sweden to $63\frac{1}{2}^{\circ}$; therefore not quite so far north as rye. In Russia the northern limits seem to coincide with those of rye. Their culture extends southwards to the northern parts of France, but not much

south of Paris (latitude $48^{\circ} 50'$). In North America wild oats are found growing too, near the northern limits of grain culture. Macoun found oats in latitude 56° four feet high, barley of nearly equal growth, wild grass three feet. (Geol. Rep., 1875-6, p. 154.)

The polar limits of the potato are beyond those of barley in Scandinavia, and advance into Iceland, where barley cannot be grown. In putting the northern limits of the potato and turnip a degree or so higher than barley, we still keep within their climatic range. Turnips will go to even a higher latitude than the potato, but the other vegetables here named will not grow so far north. As these vegetables can be used when but partly grown, they may be cultivated in higher latitudes, and in short summers, where they will not ripen, and farther north than even the coarser grains. Hence the immense areas in Canada over which these food plants may be grown.

Sir A. Mackenzie says "that in 1788 a small spot was cleared (lat. $58^{\circ} 45'$, long. 117°) at the Old Establishment (Fort Vermilion?), and sowed with turnips, potatoes, carrots, and parsnips. The first grew large, and the others thrived well." (Can. Pac. Ry. Rept., 1879, p. 31.) On the Peace River, near the Rocky Mountains, at latitude $56^{\circ} 30'$, potatoes, onions, carrots, cabbages, and other vegetables grow in the gardens, and at this date (22nd July) "potatoes planted 28th April were of very fair size, and fit for use, growth extremely rapid, thermometer 80° at noon; was informed that in 1874 there was no frost from 1st May until 15th September (107 days). In 1875 sowing commenced in the last week of April." (Geol. Rep., 1865-6, p. 152, by Macoun.)

The apple, like the cereals, has its proper home north of the summer isothermal of 70° in the cooler parts of the temperate zone, the areas of summer rains. In warmer climates the fruit is inferior in quality, although of good size. The southern and south-eastern parts of the United States are too warm for the apple; and the regions of summer droughts through all the central parts of the Continent west of the Mississippi—the treeless region—have climates destructive to the apple-tree; for a climate where deciduous trees will not grow could not be favourable for the apple-tree.

A writer in the New York *Graphic*, of October 11th, 1876, referring to the Canadian show of fruit at the Centennial Exhibition, Philadelphia, in 1876, says:—"The finest show of fruits is made by the Fruit Growers' Association of Ontario, Canada." A distinguished American pomologist, from Illinois, writing of the fruits at the Centennial, in 1876, says:—"Decidedly the best show, taking into consideration variety, quality, number, and taste, is from Ontario, Canada.

"The exhibit occupied two tables, each 200 feet long, with 1,480 plates of apples, 200 of pears, 290 of plums, 173 of grapes, 26 of peaches, 86 of crab-apples, and 20 of miscellaneous fruits, nuts, &c."

Marshall, in his work on Canada, after visiting an agricultural show which represented only the country around London, in Ontario, says:—"Upwards of a hundred varieties of apples were exhibited. For cooking

there were the Cayuga, Red Streak, or twenty-ounce pippin, an imposing fruit measuring over fifteen inches. The Alexander, of glorious crimson; the Red Astracan or snow apple, so named from the whiteness of its pulp; the Gravenstein, Baldwin, and others. For dessert there were the Fameuse, the streaked St. Lawrence, the Spitzenberg, the Seek-no-farther of gold and red" (p. 76). "The Canadian apple is the standard of excellence" (p. 7).

"Even in California, the orchard of the Union, the superiority of the Canadian apple was, to my surprise, confessed. Vast quantities are exported to England and sold as American, their nationality being lost.

"The grape thrives well, raspberries, strawberries, black-berries or brambles, cranberries, cherries, and other fruits, currants, plums, grapes, apples, &c., grow wild. Orchards everywhere thrive" (p. 77).

In 1862 the Royal Commissioners of the International Exhibition of London, asked from the representatives of all the countries at the exhibition a collection of fruit from their respective countries, to be shown in the gardens of the Royal Horticultural Society of London. It became the duty of the writer, as a commissioner from Canada, to make the collection from this country. He wrote to the Fruit Growers' Association of Upper Canada for a collection, but it being too early in the season for that society to send the fruit, the local Horticultural Society of Hamilton, a town at the head of Lake Ontario, 1,260 miles from the Atlantic, sent a collection. The officers of the Royal Horticultural Society reported that this show of apples was the finest they had ever had from any one country; and the chief countries of Europe and the United States had collections at the Royal Horticultural Gardens in that year.

In Europe the apple ripens in latitude 64° , and thrives well up to 60° . The area in Canada over which it could be cultivated would equal that of wheat. The pear will not mature so far north, but thrives well wherever tried throughout the valley of the St. Lawrence; and in British Columbia, north of 50° , attains to a great size—eleven inches in circumference. It is also grown in Manitoba. Wild plums and cherries are everywhere found throughout the valley of the St. Lawrence, and up to high latitudes as far as the deciduous forest trees extend; the black cherry especially growing to a large tree, two and three feet in diameter and sixty to seventy in height, in the southern part of Ontario. The red cherry is a smaller but more hardy tree. The wild yellow egg-plum was found in Upper Canada, on its first settlement, of a size which would be considered large amongst cultivated plums at the present time, the trees being more than a foot in diameter. Where the native plum and cherry were found growing spontaneously we may assume that the climate and soil are favourable for such fruits, and experiment has proved the correctness of this inference. The analogy of Europe would justify us in placing the northern limits of these two fruits as high as the parallel of 60° .

Canada is on the northern limit of the peach-growing zone, yet in favourable seasons immense crops have been produced over large areas in the

southern and south-western parts of Canada. The fruit, too, is of excellent quality, large, and delicious.

The climatal condition of Canada will be better understood by reference to the influence which the currents of air and ocean have upon both continents, and by comparing western coasts with western, eastern with eastern, and interior divisions with interior.

The warm currents of air and water falling upon western coasts, and aerial currents passing over the continents, elevate the temperatures of the western parts of the continents, while the cold currents pressing upon eastern shores lower the temperatures there.

The mean temperature of the Gulf Stream in the Gulf of Mexico is 80° Fahrenheit; its maximum temperature is 86° , or 9° above the ocean temperature due the latitude. Increasing its latitude 10° , it loses two degrees of heat, and after running 3,000 miles towards the north, still preserves the temperature of summer. With this temperature it crosses the fortieth degree of north latitude, and spreading out for thousands of square leagues over the cold waters of the ocean, does much to mitigate the rigours of winter in Europe. When it strikes the British Islands it divides into two parts, the main current going to the Polar Sea, the other entering the Bay of Biscay.

It has been estimated that the quantity of heat discharged over the Atlantic from the waters of the Gulf Stream in winter would be sufficient to raise the whole column of atmosphere which rests upon France and the British Islands from the freezing point to summer heat. Every western wind which blows (and the prevailing winds are from the west, or from some point near the W. or S.W. in this part of the ocean) crosses the Gulf Stream, and carries with it a portion of its heat, discharging it in its passage over Europe. The isothermal lines of 60° and 55° , starting from the parallel of 40° on the American coast, run in a north-easterly direction, retaining nearly the same oceanic temperature on the European side in latitude 55° and 60° as exists on the American coast in latitude 40° .

In the Pacific there are tropic and arctic currents like those in the Atlantic, and from similar causes. The Japan stream, or Kuro-Siwo—black stream—a name derived from the deep blue colour of its waters, flows from the south-east of Asia in a north-easterly direction, falling upon the western coast of North America. This stream, flowing many thousand miles further than the Atlantic tropic current, is not so hot nor its littoral waters so cold as those in the Atlantic, but it spreads over the entire Pacific coast of Canada. These two currents in the Pacific—the arctic and tropical—produce similar effects to those in the Atlantic; the one warming the western coast of North America in high latitudes, and the other cooling the eastern shores of Asia.

Through the agency of these two currents in the Atlantic, the western countries of Europe are much warmer than the eastern parts of America in similar latitudes; the difference being about eight degrees in latitude

41°; eleven and a half in latitude 51°; and twenty-five in latitude 58°. Similar causes in operation in the Pacific Ocean give an equal elevation of the temperature of the western coasts of America over the eastern coasts of Asia in the same latitudes—the arctic currents chilling the one and the tropical currents warming the other.

From Vancouver, in latitude 49° to Sitka in 57°, the summer temperatures are as high and as uniform as in the west of Europe, except where the vicinity of mountains may modify the normal conditions of climate. Sir John Richardson says “the climate of Sitka” (on the Pacific coast) “is much warmer than that of Europe in the same parallel.” (*“Arc. Ex.”* vol. 2, p. 279.) The isothermal of 60° for the three summer months rises as high as latitude 63° east of the Rocky Mountains in the valley of Mackenzie River. Yukon, west of Mackenzie River, and within the Arctic circle, latitude 67°, has a July of 65° 7', and an August of 60°.

In comparing the well-known regions of the Old World with the less known corresponding parts of the New, western coasts with western, eastern with eastern, and interior divisions with interior, we find a remarkable similarity in the climates of the two continents. The United States are similarly situated on the North American continent, with China on the Eastern; in latitude, in position on the continents, they are the same, and in climates similar. Canton, in China, lat. 23°, has a summer temperature of 82°; and Key-West, in Florida, lat. 24° 32', a summer of 82°; Pekin, lat. 40°, has a summer of 76°, which is only two or three degrees above that of Philadelphia, of the same latitude. Nagasaki, Japan, and Charleston in South Carolina, in the same latitudes, have summers of 80°; London in the west of Europe, and Vancouver in the West of North America, in similar latitudes, have the same mean summer temperatures, about 61° and a half; Sitka, in lat. 57°, Sir John Richardson says, has a climate much warmer than Europe in the same latitude. The climates of the interior are warmer in summer and colder in winter than those on eastern and western coasts, but are somewhat similar on both continents, being, however, warmer on the Red, Saskatchewan, and Mackenzie Rivers, than in the same parallels on the eastern continent. The isothermal of 65° for the three summer months, crosses the Red River in latitude 50°, and rises on the Mackenzie to latitude 60°.

The summer rains, too, throughout Canada, are similar to those in Europe in the same latitudes from the Mediterranean to the Arctic, being somewhat uniform during the agricultural months, but more copious in Canada.

South of the boundary between Canada and the United States, west of the Mississippi, are the areas of summer droughts, a rainless, treeless, desolate region, similar in position on this Continent, and in the character of the country, to the desert areas of the Old World—the one beginning on the western coasts of Mexico and California, and extending to British America on the north, and over half the Continent eastward; the other beginning on the western coast of Africa, near the same latitude as the

American desert, and extending north-eastward, or east by north, over Africa, Palestine, Turkistan, and Manchu Tartary, 9,000 miles in the direction of the prevailing winds.

Those regions of summer droughts cover about one-half the area of the United States. In addition to the absence of summer rains, we have the authority of trustworthy and impartial witnesses—American writers—for the statement that a large percentage of that part of the Continent has soils so deeply impregnated with saline matter that crops could not be grown by irrigation even if it were possible to get water. That entire area must therefore be comparatively worthless as a grazing and grass-growing region, and for crops which require the summer for their growth and maturity.

If we turn to the north, from this region of summer droughts to that of summer rains, and moderate temperatures in the agricultural months, we find the greatest contrast. The native grasses are found in Canada at higher latitudes than it is possible to grow barley; but assuming that the northern limits of barley will also be those of the cultivable grasses, there would be in the Dominion an area of at least two millions (2,000,000) of square miles, or more than twelve hundred millions (1,200,000,000) of acres, to the northern limits of which native grasses are found. The luxuriance of these native grasses, to very high latitudes, is shown by those regions being the chosen pastures of the bison and deer. These higher latitudes, too, taking Europe as our guide, will be the chief home of the ox, the sheep, and the horse. Deducting from these twelve hundred millions of acres such percentage as is found, say, in Europe, unsuited to pastures and meadows—and these lands lie chiefly in the valleys of great rivers, with a small percentage of poor soil—there would still remain a practically boundless area of the best grass lands on the Continent.

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